

# Assessment of the Pre and Post Uprate Impacts of the FPL Turkey Point Cooling Canal System

Biscayne Bay Regional Restoration Coordination  
Team

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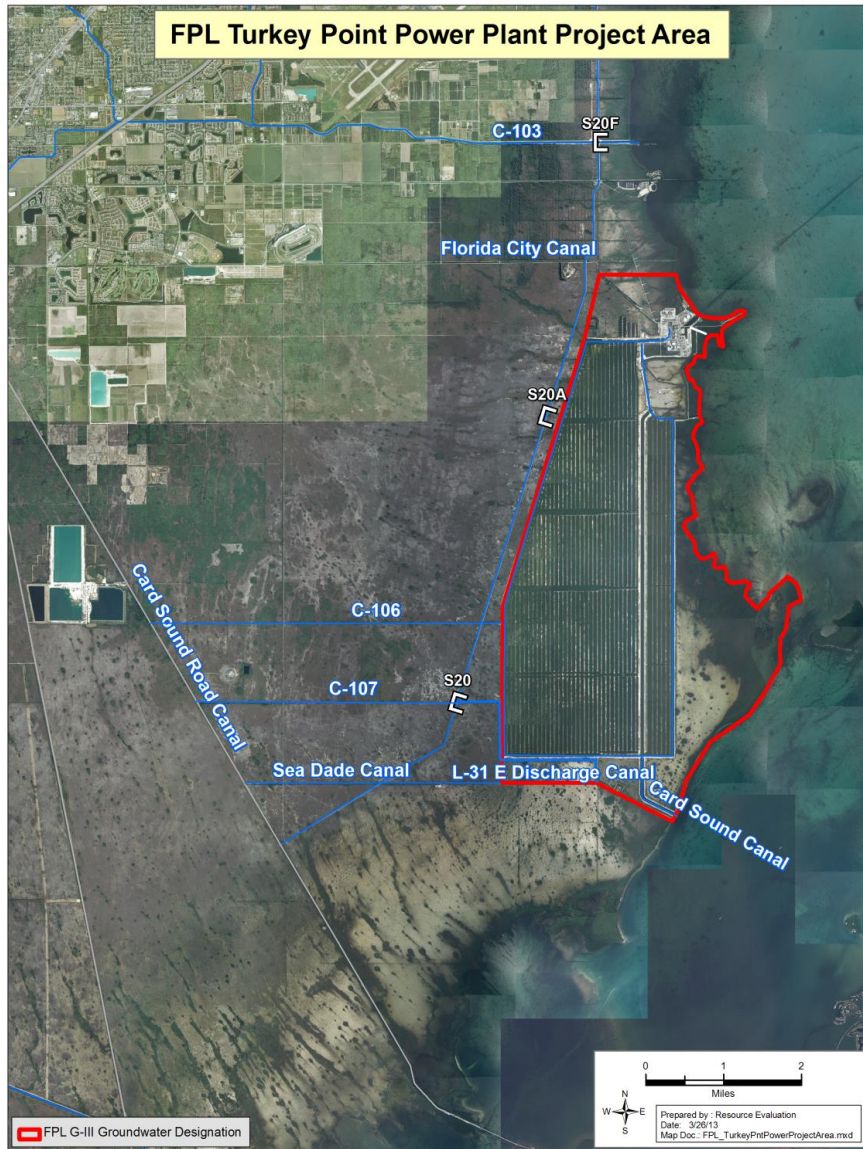
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# Presentation Overview

- Summarize technical data and evaluations conducted by the Agencies
- Present Agencies' findings and conclusions related to evaluation of FPL Units 3 and 4 pre-uprate data
- Follow-up actions and the CCS Salinity Management Plan

# FPL SFWMD Fifth Supplemental Agreement



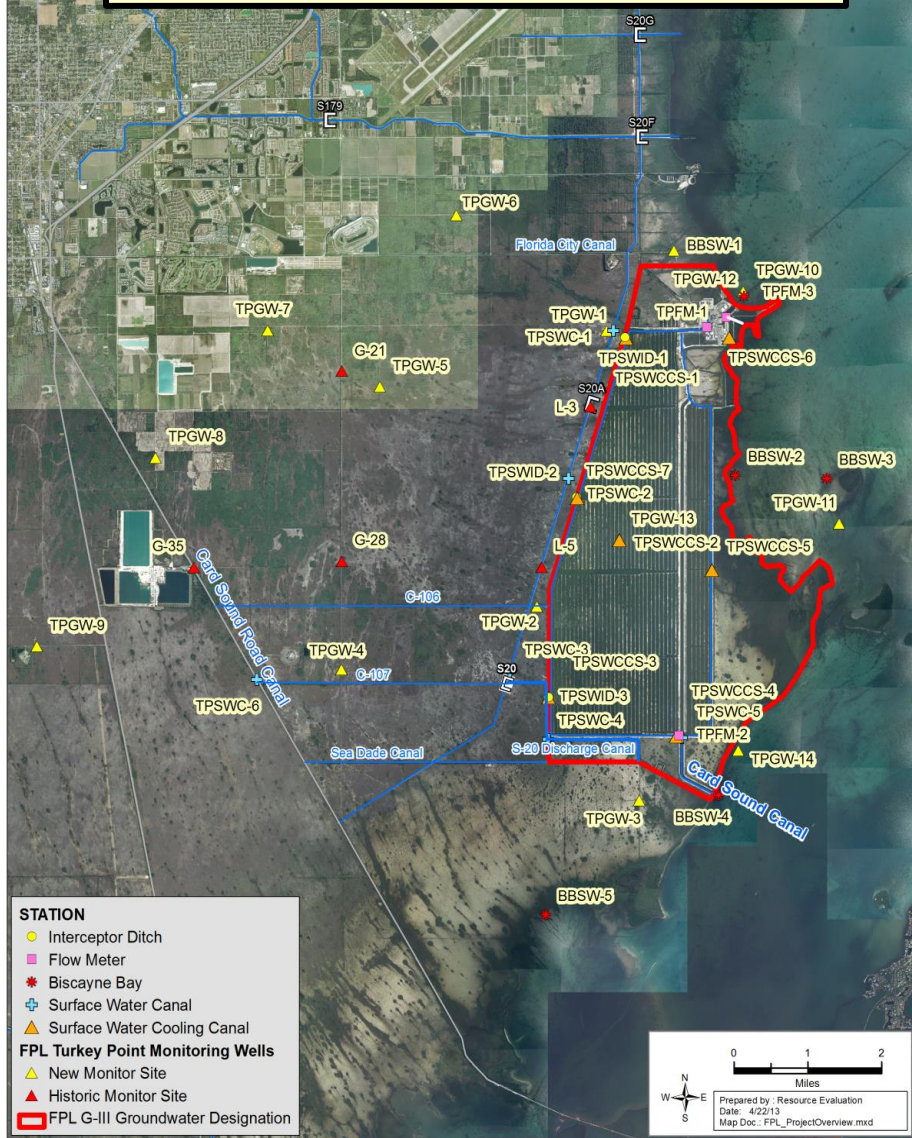
- **Original Agreement implemented in 1972**
  - CSFFCD/District review and approve CCS design and operations
  - Monitoring program and interceptor ditch operations
  - Authorized actions in event of CCS impacts
- **Monitoring plan expanded commensurate with Unit 3 and 4 uprate in 2009**



# FPL Data Collection Summary

- 19 groundwater monitor sites (47 wells)
  - Quarterly chemistry
  - Automated water level and physical parameters
- 22 surface water monitor sites
  - Quarterly chemistry
  - Automated water level and physical parameters
- Ecological; wetlands and Bay
  - Porewater sampling
  - Semiannual floral and faunal transects
- Weather data
- Quality Assurance Project Plan

## FPL Turkey Point Surface and Groundwater Monitor Network



## FPL Turkey Point Ecological Transect Network



# Scope of Agencies' Evaluation

- Data/information reviewed
  - FPL Turkey Point Comprehensive Pre-Upgrade Report
  - Data collected per Turkey Point Monitoring Plan
  - Area synoptic monitor data
- Evaluation Process
  - DEP, SFWMD, Miami-Dade County
  - Six Interdisciplinary agencies teams
  - Presentations and draft reports shared with FPL

# Distinguishing CCS Water in the Environment

- CCS water is basically concentrated Bay water making differentiation between marine and CCS derived saline water difficult
- Tracer suite; tritium in conjunction with marine based saline water
  - Screening level threshold: 20 picocuries per liter
- Limitations
  - Tritium half life: 12.3 years
  - Travel times uncertain



# Findings/Conclusions





# Surface Waters and Wetlands

- Biscayne Bay:
  - No indication of CCS upwelling in the Bay
  - No clear trends in Bay faunal densities
  - Significant differences in total seagrass with distance from shore; not clearly attributable to CCS
- Wetlands:
  - Ecological data variable; trends hard to detect; variations not clearly attributable to CCS
  - Tritium levels measured in porewater surrounding CCS facility
  - Any CCS impacts to wetlands have likely equilibrated over decades
  - Impacts of post uprate conditions may be difficult to detect unless influence is more dramatic

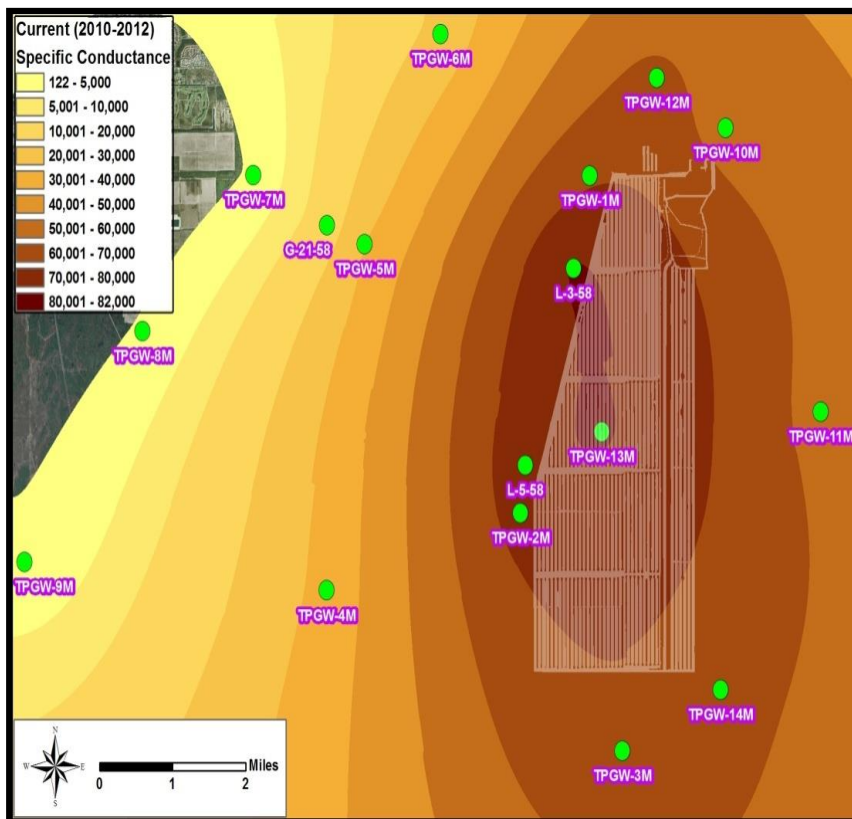
# Surface Waters and Wetlands

- CCS water occurring in the Card Sound and L-31E Discharge canals at low levels
- Minimal occurrences of CCS water have been measured in the L-31E canal upstream of S-20 and in Card Sound Road canal located to the west
- Potential for impact to Biscayne Bay Coastal Wetland CERP project considered minimal



# CCS Water Occurrence in Groundwater

- CCS water occurring at depth in groundwater surrounding the plant
- Groundwater near base of aquifer was saline prior to CCS but has increased over time
- CCS water most concentrated near plant and the plume thins, deepens and is less concentrated with distance from facility

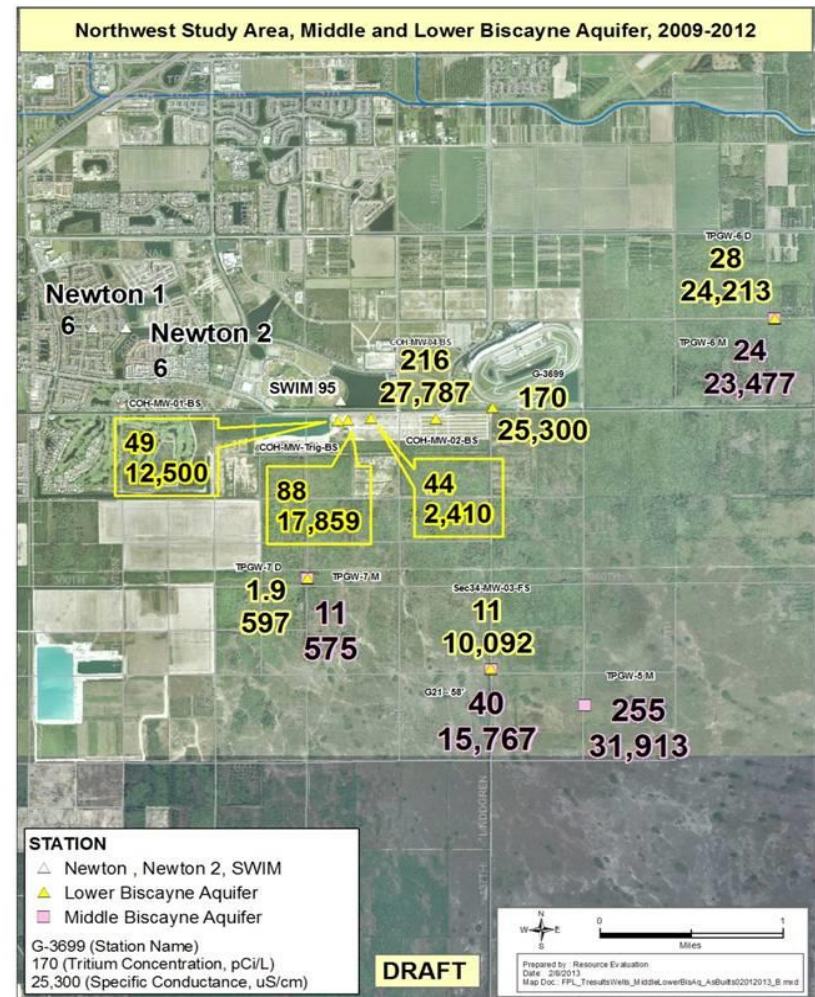


Specific Conductance: Intermediate horizon

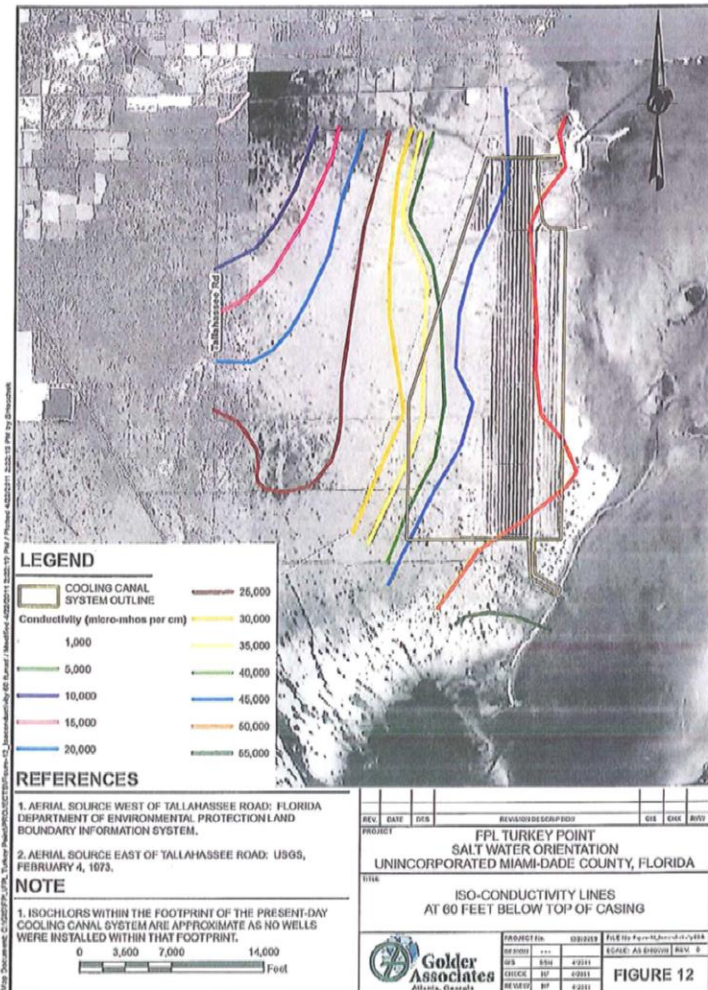


# CCS Water Occurrence in Groundwater

- CCS water identified at low concentrations 3.75 to 4.1 miles to the west/northwest (1.5 miles from the Newton PWS wells)
- Long term average CCS migration rates are estimated between 420 and 720 ft per year
  - Many uncertainties with these estimates



# Groundwater Salinity Changes since 1973



- Specific conductance at depth within the aquifer has increased by 20,000 to 30,000  $\mu\text{S}/\text{cm}$  within one mile of the CCS facility and by more than 10,000  $\mu\text{S}/\text{cm}$  at distances between 2.8 and 3.8 miles west.
- CSS water characterized by elevated tritium levels present
- The western extent of marine water has moved inland approximately 2 miles
- The estimated western location of the G-III groundwater boundary at the 40 ft depth horizon has moved inland between 1 to 2 miles

# CCS Water Budget Evaluation

- Water budget estimates conducted by FPL and District contractors indicate that CCS water is seeping from the bottom of the CCS facility at variable rates based on climate, CCS salinity and operational variables
  - Discharge is highest in the northwest corner and virtually no discharge occurs to the northeast
  - Long term estimated seepage to groundwater is one million cubic feet per day (7.5 mgd)



# Interceptor Ditch Effectiveness



The Interceptor Ditch Operation Plan (IDOP) has not been successful in restricting westward migration of saline water at depth within the aquifer

- The IDOP appears to have been successful in restricting westward saline water movement in the upper portion of the aquifer but effective controlling seepage at depth
- Insufficient data to determine if the IDOP has successfully restricted shallow saline water movement in the southern reaches of the CCS

# Follow-up Actions



# CCS Salinity Abatement

- April 16, 2013 District directs FPL to initiate consultation for mitigation, abatement or remediation per provisions of 5<sup>th</sup> Supplemental Agreement
- May 1, 2013 FPL agrees to work with the District and FDEP on mitigation of CCS water in the region
- June 18, 2013 FPL presents District/DEP with a proposal for CCS salinity management
- July 15, 2013 FPL provides a technical memorandum and comprehensive documentation of their CCS salinity management proposal



# Proposed Abatement Strategy

- Manage CCS salinity to equal Bay salinity
  - Source water for dilution; 14 mgd Floridan aquifer
  - CCS salinity dilution goal met in 1 -2 years
  - Salinity reduction most dramatic beneath the CCS thereby reducing driving head by lowering CCS water density
  - Inland migration of saline water at base of the aquifer would be abated over 30 year model horizon

# District Staff Evaluation Plan

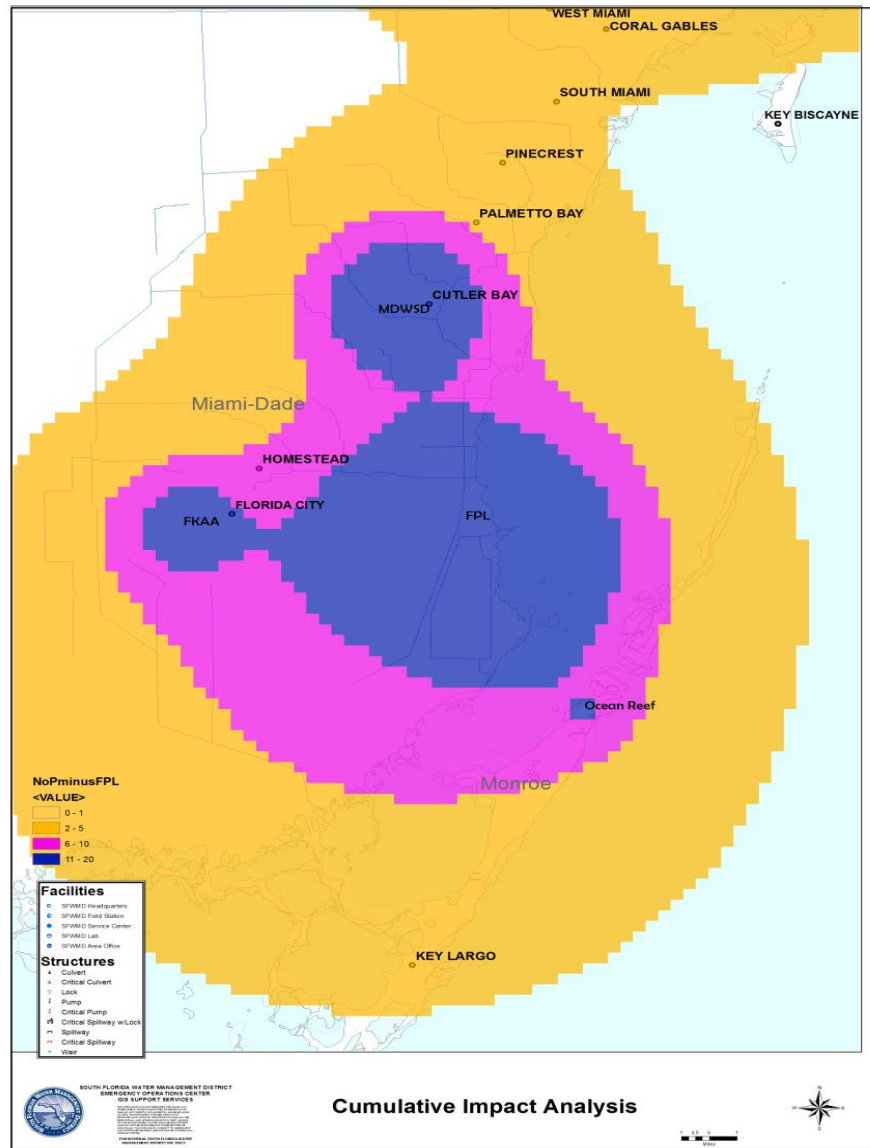
- Evaluate FPL's data, models and documentation to gain a full understanding of the proposal
- Identify non-unique assumptions and/or data in FPL's models for additional assessment as necessary
- Conduct sensitivity model runs testing alternative plausible assumptions and/or data values to better understand model capabilities
- Evaluate FPL's proposal and conclusions using information gain from FPL's and District simulations

# District Staff Evaluation Plan

- Evaluate drawdown impact of proposed 14 mgd withdrawal from the Floridan aquifer using District regional FAS model
- Rerun FPL Biscayne aquifer model using FPL's data with consistent datum
- Generate alternative aquifer parameters/boundary conditions data sets and recalibrate model
- Conduct District generated sensitivity runs
- Generate 'basis of comparison' model simulation runs
  - 'No Change' option
  - 'CCS held at Bay salinity' option

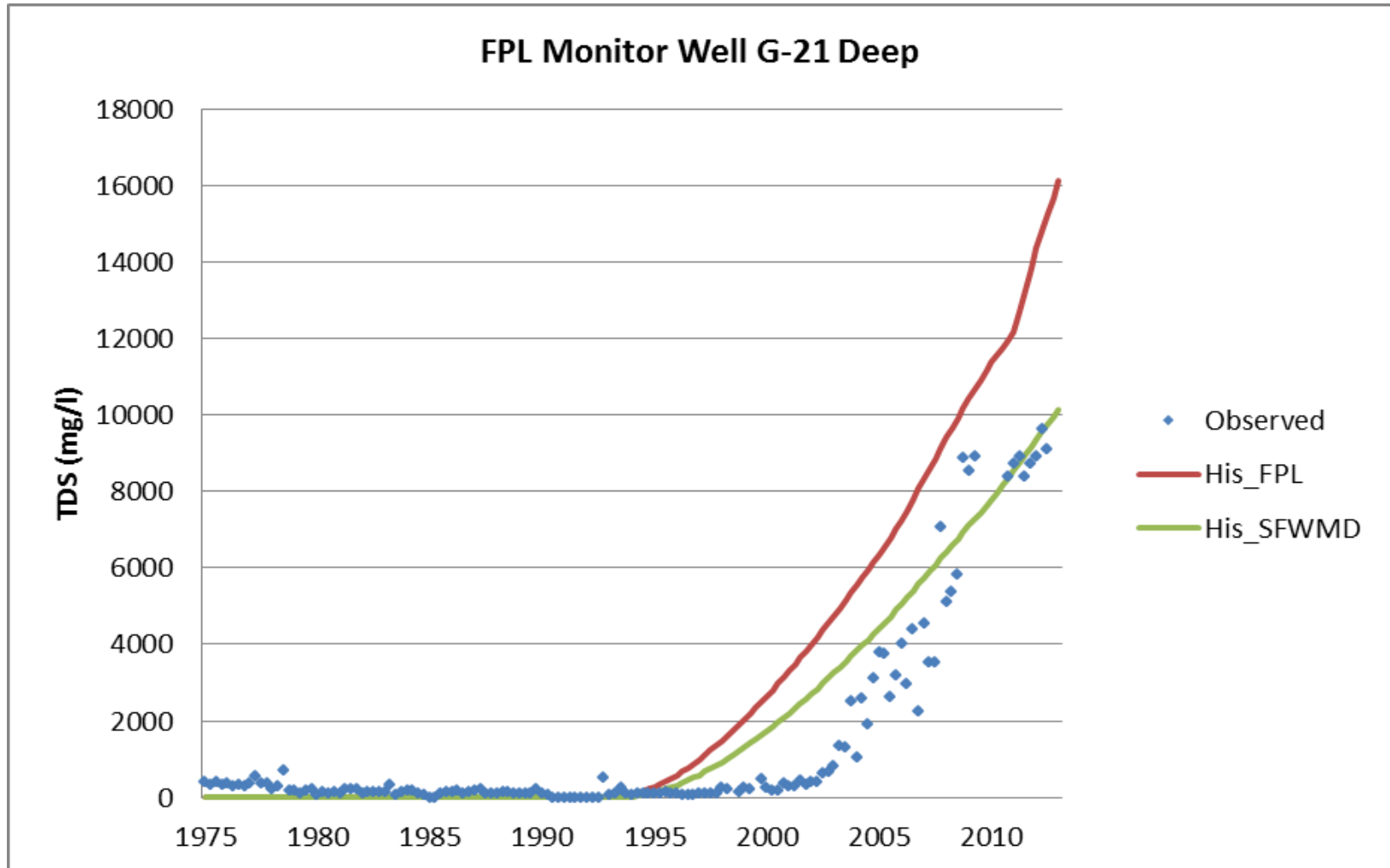


# Cumulative Drawdown in Upper Floridan Aquifer

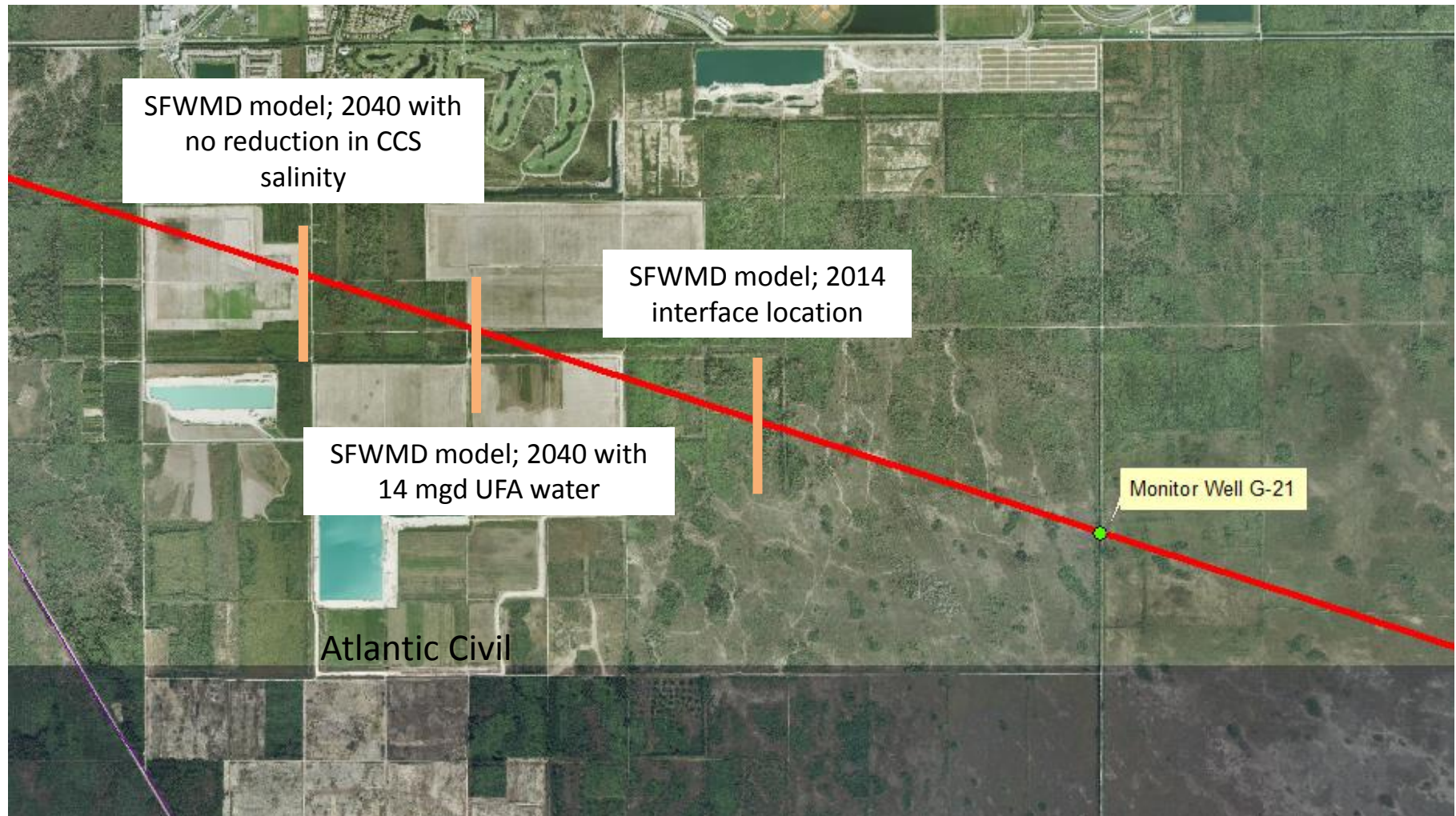


# Calibration of Salinity at Well G-21

(-58 ft monitoring horizon)



# District Model: Historic and Future Interface Location; No Change to CCS Salinity





# Conclusions

- Proposed withdrawal of 14 mgd from the Upper Floridan aquifer does not cause significant increased drawdowns to existing legal users
- Two-dimensional model is limited and precludes evaluation of many hydrologic features and operations needed to fully simulate conditions in south Miami-Dade County
- Modeling supports proof of concept that freshening the CCS will slow the westward migration of the saltwater front
- While FPL's initial conclusion that the saltwater front would move eastward is not supported, both FPL and District models suggest reduced CCS salinities will effectively abate westward migration of the saltwater interface compared to the no action option

An aerial photograph of an industrial facility, likely a water treatment plant, situated along a body of water. The facility features several large, cylindrical storage tanks in the foreground, two tall smokestacks in the center, and various industrial buildings and piping. The surrounding area includes greenery and a paved road. The sky is filled with large, white clouds.

# Question/Discussion

# Data Characterization

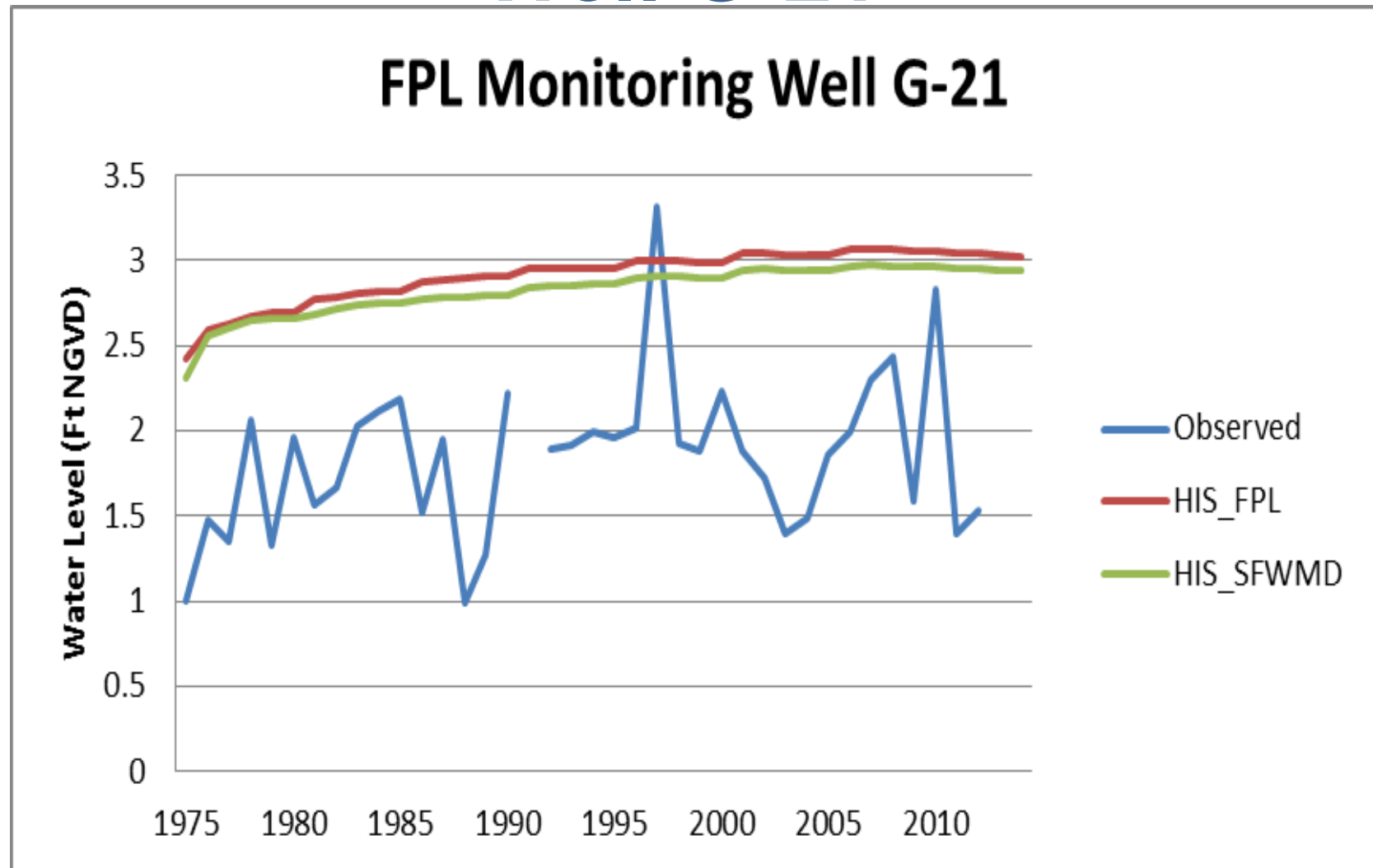
- FPL's commercial lab not always successful in meeting quality assurance standards for this project
  - Dilution complications
  - Regulatory versus research standards
  - Evaluations of major ion balances show data generally reasonable and usable for estimating salinity
  - Precision not at level for use in tracing water mass movement
- Ability to remove some surface water sites without reducing certainty of results
- Auto sampling frequency reductions possible without reducing certainty of results

## FPL Projected Floridan Drawdowns on Existing Legal Users

Existing Legal User	Permitted UFA Allocation	Projected Drawdown
FPL Unit 5 (2009 Power Plant Certification)	12.6 mgd	42.6 feet
Florida Keys Aqueduct Authority	6.97 mgd	1.2 feet
Ocean Reef Country Club	0.58 mgd	2.4 feet
Ocean Reef Country Club	1.42 mgd	2.6 feet
Miami Dade Water and Sewer Department (South Miami Heights Wellfield)	23.3 mgd	0.5 feet



# Calibration of Water Levels at Well G-21



# District Model: Historic and Future Interface Location; CCS Salinity Equal Bay Concentrations

